CLAIMS

1. A non-contact system for composing microarrays comprising:

   a first arm assembly for manipulating a liquid source plate, said liquid source plate having a plurality of source wells each adapted to hold a material for forming said microarrays;

   a liquid transfer plate having a fill side and a dispense side and a plurality of channels extending therethrough;

   a second arm assembly for manipulating the liquid transfer plate, said second arm assembly configured to align a first channel of said plurality of channels with a first source well of said plurality of source wells such that when a first material contained in said first source well is ejected from said first source well said first material enters said first channel;

   a non-contact liquid dispensing device for ejecting said first material from said first source well into said first channel; and

   a pressure source fluidly connectable with said fill side of said liquid transfer plate wherein said pressure source is configured to controllably increase pressure to one or more of said channels thereby ejecting at least a portion of said materials from said liquid transfer plate onto a target substrate.

2. The system of claim 1 further comprising a dispense nest configured to receive said liquid transfer plate from said second arm assembly and hold said liquid transfer plate when said liquid transfer plate dispenses said materials onto said target plate.

3. The system of claim 2 wherein said nest is controllably movable in the XYZ directions with a third arm assembly.

4. The system of claim 1 further comprising a fourth arm assembly for carrying and positioning said target substrate relative to said liquid transfer plate.

5. The system of claim 4 wherein said fourth arm assembly is controllably movable in the XYZ directions.

6. The system of claim 5 wherein said second arm assembly is configured to position said target substrate over said liquid transfer plate.
7. The system of claim 1 wherein said second arm assembly can rotate angularly such that said liquid transfer plate may be rotated upside down.
8. The system of claim 1 wherein said channels have a varying diameter from the fill side to the dispense side.
9. The system of claim 8 wherein said channels have a decreasing diameter from the fill side to the dispense side.
10. The system of claim 1 further comprising a multiwell plate stacker for holding a plurality of source well plates.
11. The system of claim 1 further comprising a liquid transfer plate stacker for holding a plurality of liquid transfer plates.
12. The system of claim 1 wherein the non-contact liquid dispensing device is an acoustic emitter positioned underneath the source well plate.
13. The system of claim 4 wherein said fourth arm assembly further comprises a target tray for holding at least one target substrate.
14. The system of claim 13 further comprising a tray stacker for holding a plurality of trays.
15. The system of claim 1 further comprising a camera for viewing dispensing.
16. The system of claim 1 further comprising a computer and said computer controls movement of said first and second arm assemblies.
17. The system of claim 16 wherein said computer further determines a number of target substrates to be printed such that a difference in time between loading the liquid transfer plate with materials to be dispensed and ejecting materials from said liquid transfer plate onto each of said target substrates is less than 10 seconds.
18. The system of claim 1 wherein said target substrate is a multiwell plate.

19. The system of claims 1 wherein said target substrate is a flat slide.
20. A liquid transfer plate for transferring biological and chemical materials onto a target substrate comprising a thin planar body having a fill side, a dispense side and a plurality of channels extending from said fill side to said dispense side.
21. The liquid transfer plate of claim 20 wherein said liquid transfer plate is rigid and formed from a substance selected from the group consisting of glass, ceramic, silicon wafer, plastic, stainless steel, tungsten, beryllium, and molybdenum.
22. The liquid transfer plate of claim 20 wherein said channels have a varying diameter.
23. The liquid transfer plate of claim 22 wherein said diameter decreases from said fill side to said dispense side.
24. The liquid transfer plate of claim 20 wherein said body has a thickness in a range of 4 mm to 0.1 mm.
25. The liquid transfer plate of claim 20 wherein said channels have a circular cross section and have a diameter in a range from 2 mm to 0.1 mm.
26. The liquid transfer plate of claim 25 wherein said diameter is in a range from 1 mm to 0.1 mm.
27. The liquid transfer plate of claim 20 wherein said body has a constant cross section from the fill side to the dispense side.
28. The liquid transfer plate of claim 20 wherein said channels form a rectangular array.
29. The liquid transfer plate of claim 20 wherein said channels form a non-rectangular array.
30. The liquid transfer plate of claim 20 wherein said body has a shape selected from the group of square and rectangular.
31. The liquid transfer plate of claim 20 wherein said body has a shape selected from the group of circular and oval.

32. A non-contact method for composing a microarray onto at least one target substrate comprising:

loading a first liquid transfer plate with primary materials to be printed; and

dispensing at least a portion of said primary materials onto said at least one target substrate.

33. The method of claim 32 wherein said loading comprises transferring a first liquid from a first source well of a multiwell plate to a first channel of a plurality of channels extending through said first liquid transfer plate.

34. The method of claim 33 wherein said loading further comprises transferring a second liquid from a second source well of said multiwell plate to a second channel of said first liquid transfer plate.

35. The method of claim 32 further comprising moving at least one of said first liquid transfer plate and said at least one target substrate into a dispense position such that when said primary materials are ejected from said liquid transfer plate said primary materials contact said at least one target plate.

36. The method of claim 34 wherein said dispensing includes dispensing a portion of said first and second liquids from said first and second channels respectively onto each target substrate of a first set of target substrates.

37. The method of claim 36 wherein said first and second liquids are dispensed onto 10 to 50 target substrates.

38. The method of claim 32 further comprising loading a second liquid transfer plate with ancillary materials.

39. The method of claim 38 wherein said loading the second liquid transfer plate is performed while said dispensing the primary materials is performed.

40. The method of claim 39 further comprising dispensing said ancillary materials onto a second set of target substrates.

41. The method of claim 38 wherein said second liquid is different than said first liquid.

42. A method for composing a microarray onto a plurality of target chips comprising:

selecting a number of spots to be printed onto a target chip;

determining a channel configuration for a liquid transfer plate used to dispense materials onto said plurality of target chips;

determining a number of liquid transfer plates necessary to complete printing said number of spots from said selecting step; and

determining a number of target chips such that the difference between the time to load materials into each and every channel of a liquid transfer plate and the time to print materials from a liquid transfer plate onto each and every target chip of said number of target chips (dT) is minimized.

43. The method of claim 35 wherein said dT is less than 100 seconds.

44. The method of claim 36 wherein said dT is less than 10 seconds.

45. The method of claim 37 wherein said dT is less than 1 second.